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MORPHOFUNCTIONAL FEATURES OF INTERVERTEBRAL DISCS OF DIFFERENT PARTS OF THE SPINE

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Abstract
Intervertebral discs (IVDs) are key functional elements of the spinal column, providing it with flexibility, stability and cushioning. Their anatomical and physiological characteristics vary depending on the spine, which causes different clinical symptoms in degenerative changes. This article discusses the morphofunctional features of intervertebral discs of the cervical, thoracic and lumbar spine.
Introduction. The intervertebral disc is a cartilaginous formation located between the vertebral bodies, and consists of a pulpous nucleus, a fibrous ring, and end plates. Despite the general structure scheme, discs in different parts of the spine have a number of anatomical and histological differences that reflect the characteristics of the load and biomechanics of the corresponding segments. These differences are of fundamental importance for understanding the pathogenesis of osteochondrosis, herniated discs, and other degenerative-dystrophic diseases of the spine.

Keywords: Intervertebral disc, pulpous nucleus, collagen, disc herniation, degenerative changes, radiculopathy, lumbar ischialgia, spinal morphology.

Introduction

Anatomical features

In cross-section, the shape of the intervertebral discs varies by department:

- In the cervical region (C3–C7), the disc has an elliptical shape, providing a high degree of mobility.
- In the thoracic region (Th5–Th9) — the shape is close to rounded, which corresponds to the stabilizing function of this zone.

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- In the lumbar region (L4–S1), the disc becomes oval or kidney-shaped, adapted to the maximum mechanical load.

1-photo. Cervical-thoracic region (T1 and T2-weighted images) - show the normal structure of the discs, spinal cord and signs of degeneration with a moderate effect on the canal (upper left corner).

Lumbar region (T1 and T2-weighted sagittal images) - show normal disc anatomy, vascular adipose tissue, and nerve structures, which is useful for training and diagnosis .

The height of the discs also correlates with the function performed: on average, it is 4-6 mm in the cervical region, 3-5 mm in the thoracic region, and reaches 7-10 mm in the lumbar segment.

Biochemical and histological differences

The pulpous nucleus of the intervertebral disc in young individuals is rich in water and contains mainly type II collagen, which gives the tissue elasticity. With age and under stress conditions, dystrophic changes occur, accompanied by dehydration of the nucleus and an increase in the content of type I collagen.

- In the cervical and поясничномlumbar regions, a high degree of core hydration is maintained, which is necessary for cushioning.
- In the thoracic region, there is an average level of hydration and a mixed type of collagen (I and II), which reflects relatively low mobility and load.

Degenerative changes and herniation

The localization of degenerative foci in the intervertebral discs varies depending on the spine:

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- Cervical — преимущественно region-mainlyanterolateral degeneration;
- Thoracic region-degenerative changes are expressed minimally;
- Lumbar заднеregion — posterolateral foci are more often observed, which is due to vertical load and a tendency to protrusions and hernias.

Accordingly, the vulnerability of discs to herniation is most pronounced in the lumbar region, moderate in the cervical region, and minimal in the thoracic region.

Clinical manifestations

The clinical picture of intervertebral disc damage is determined by the level of the segment involved:

- In the pathology of the cervical region-there are cervical radiculopathies, restricted movement, headache, vertebrogenic symptoms.
- When the thoracic region is affected, thoracalgia occursторакалгия, often simulating heart or pleural pain.
- With changes in the lumbar region, lumboishialgia, pain radiating to the lower extremities are characteristic, paresis of the foot and impaired sensitivity are possible.

Conclusion

Morphofunctional features of intervertebral discs reflect adaptation to the biomechanical conditions of a particular part of the spinal column. Given the differences in anatomy, hydration, collagen composition and predisposition to degenerative processes, it is important to conduct a differentiated diagnosis and treatment of diseases of the spine, taking into account the level of damage. The lumbar spine is of the greatest clinical significance, as it is the most vulnerable to herniation and neurological complications.

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